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BUD-WORMS IN CORN

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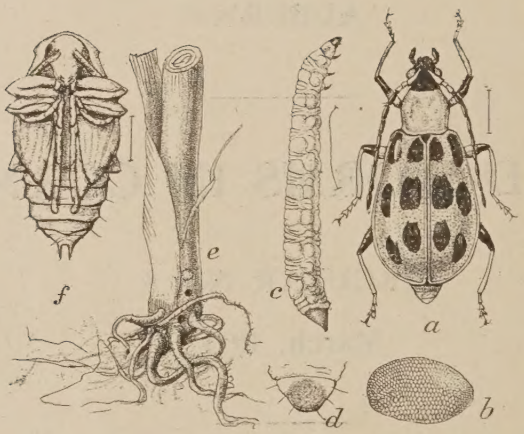

Fig. 1.—Southern corn root-worm (*Diabrotica 12-punctata*): *a*, beetle; *b*, egg; *c*, larva; *d*, anal segment of larva; *e*, work of larva at base of cornstalk; *f*, pupa—all much enlarged except *e*, which is reduced (reengraved after Riley, except f_2 after Chittenden.—(*U. S. Bureau of Entomology*).

BUD-WORMS IN CORN.

(Diabrotica 12-punctata Oliv.)

Next to the little, black corn weevil which attack the grain in the crib, the "bud-worm" is undoubtedly the worst corn pest in Alabama. In response to several hundred letters recently sent out to farmers all over the State by the Entomologist more than half the replies asked for information concerning bud-worms. It is in response to such inquiries that this circular is written.

This insect, which is known more generally as the Southern corn root-worm, is found throughout the United States from the Atlantic to the Rocky Mountains and from Canada to Mexico. Its original home was probably in Mexico, from whence it spread into the United States. It is more of a Southern than a Northern insect, not being especially injurious north of Virginia, Maryland and Southern Ohio.

The bud-worm has been known for many years, although at first it was only known as being injurious to cucumbers and melons. In fact it was, for a long time, called a "melon-worm." The adult beetles were known to feed on the leaves and fruit and it was supposed that the grubs also fed on these plants. It was not until 1883 that it became known as an enemy to corn, and the record then came from the prarie lands of Alabama. Today it is known by one name or another throughout the South as a corn pest. In Alabama it is most commonly called the "bud-worm," although the name "drill-worm" is sometimes used.

The adult of the bud-worm (fig. 1, a) is one of our most common insects. It is a small, hard-shelled beetle, yellow-green in color, with twelve black spots on the wing-covers. It is about 1-4 inch long. This beetle feeds upon nearly every plant that grows; on the blades, green ears, silk and pollen of corn; on alfalfa, clover, wheat, oats, rye, cotton,

cabbage, beets, mustard, cucumbers, melons, Irish potatoes, tomatoes, asparagus, beans, and many other vegetables; on the buds and blossoms of fruit trees; and on countless wild and cultivated flowers. In the early spring it feeds on young rye and oats and fruit tree blossoms. Some beetles may be found on the earliest blossoms of peach and wild plum. In the fall they may be found in large numbers on the blossoms of chrysanthemums.

The adults may be found, in Alabama, during every month of the year. They live over winter finding shelter under leaves, boards and rubbish. They often come out on warm days and may be seen flying. With the first warm days of spring, always a week or two before corn can be planted, some of the beetles leave their winter shelter and may be found feeding in the fields and among the fruit trees. Even at this time the females are full of eggs and are ready for the first corn planted.

As soon as the corn is up the beetles lay their eggs in the ground near the little stalks. Each female usually lays about 75 eggs although some have been known to lay as many as 200. It is a common belief among farmers that the eggs are laid at night, especially on cool nights such as we have in April. It is quite possible that this is true but this point has never been certainly determined. These eggs (fig. 1, g) are dull yellow in color and are very small, measuring about 1-40 of an inch in length, so that it is very difficult to find them. They hatch in about a week, taking a little longer in cold weather.

From the egg comes a very small, slender grub, white or yellowish in color with a brown head. (fig. 1, c). This little "worm" immediately commences feeding on the corn. It may drill a hole right into the heart of the stalk, near the upper circle of roots. If this happens the inside leaves or "bud" will wilt and finally die. This is what gives the insect its common names of "bud-worm" or "drill-worm." Only a small percentage of the grubs kill the corn, however. Most of them feed on the roots, cutting holes into them and occasionally cutting them in two. While this may cause some of the outer leaves to wilt and sometimes

even to die it very often has no noticeable effect on the stalk. Many apparently sound stalks have been found with from three to six grubs feeding on their roots. Often times on low land every stalk will have one or more grubs on it and yet there may be an excellent stand. It is probable that in most cases the bud-worm never leaves the stalk of corn upon which it commenced feeding. Nevertheless it has been proven by experiments that the worms can and will, if necessary to find food, travel as much as ten inches through the soil and some have been known to go straight down into the soil for a depth of eight to ten inches.

It has never been clearly proven that the grubs of this species feed on anything but corn but they have been found in the soil around the roots of wheat, rye, millet, rescue-grass, sedges, beans, Jamestown weed and pigweed, and it seems very probable that the insect may breed on the roots of these plants also.

The little grub becomes full grown in from 2 to 4 weeks, depending on the temperature of the soil at this time. It is then about 1-2 inch long. Leaving the plant it forms a cell in the earth in which to go through its changes from the grub to the adult beetle form. These changes (the pupal stage, see fig 1,f) take about a week and at the end of that time the insect emerges from the ground as a fully developed beetle.

These beetles appear commonly during June and July and soon lay eggs for a second generation. Where the eggs of these are laid is not positively known. Some think that they are laid on corn as are the eggs for the first generation, but in many cases where the adults have been very abundant no grubs could be found on the corn roots. It seems quite possible that at least part of the second generation breeds on some of the common weeds about our fields. If this is true the destruction of such weeds would materially lessen the number of beetles to lay eggs the next spring. The adults of the second generation appear during September and October and may be found from then till cold weather feeding on chrysanthemums and other fall flowers. When cold weather comes they seek shelter and reappear the fol-

lowing spring ready to lay eggs as soon as the corn is up.

There are many varying opinions among planters concerning the bud-worm, as to the damage done and the best methods of control. However, on a few points nearly all agree. First, that the worms are worst in cold, wet soils such as grey bottom lands, and that they do their greatest damage during April while the nights are cool. As soon as warm weather comes and the soil becomes light and dry the bud-worm work ceases. Also the injury is never as severe on upland as on bottom land. It is evident that the worms depend upon a certain degree of moisture in the soil and from this fact we may conclude that proper drainage would help to reduce bud-worm injury in many cases.

Many planters believe that the only way to overcome the bud-worm is to plant corn early. It has been shown, however, that some beetles are always present before we can possibly plant corn and that they are waiting to lay eggs as soon as a food supply for their young is available. Consequently, although corn planted very early might be less injured than that planted in April, it would be more severely eaten than corn planted still later or about the first of May. It has been proven by experiments that corn planted after the first of May suffers practically no damage from bud-worms. This is due to the fact that nearly all of the beetles will have laid all of their eggs by that time so that they will have none left for the late corn.

It is also a common belief that a good crop of corn cannot be made if planted as late as the first of May, but progressive, practical men have been found throughout the State, who are planting as late or even later than that and are making excellent crops, many of them the best in their communities. Further, bottom lands, on which the bud-worms are always worst, should ordinarily not be planted until the first of May for a good crop, unless such bottom lands be especially well drained.

It is probable that draining the land (tile drainage) might be of aid in combatting this pest. Such a system would

drain the soil earlier in the spring leaving it dry and well aired, a condition very unfavorable to the bud-worm.

Many experiments have been made in treating the seed with various insecticides and repellants, such as kerosene emulsion, tar, etc. None of these has been successful, however, as in nearly all cases the insecticide killed part of the seed and a poor stand resulted. Kainit does not seem to affect the worms in any way.

It has been found however that when 5 or 6 kernels are planted in a hill one or two of them will nearly always escape injury. Where the bud-worm injury is at all severe it would undoubtedly pay to adopt this practice rather than to replant two or three times. Where for any reason the stand is left imperfect, it will be found more profitable to fill in vacant spaces by transplanting some of the surplus healthy plants as can be easily done with one of the inexpensive implements now on the market, than to go with a poor stand or even to replant.

The bud-worm is a pest which has been so common for many years that most planters have come to look upon it as a necessary evil. It is true that we cannot now recommend any direct insecticidal measures which may be relied upon for its practical control. It is certain, however, that its damage can be very largely reduced or prevented by such measures as planting after the first of May, planting a large number of kernels to the hill, properly draining what would otherwise be wet, heavy soils, eradicating weeds and similar practices which may be included in the best farm practice. The application of these measures will reduce bud-worm injury to a minimum.